

Toward an EMRS: Object-Oriented Models of the Clinical Domain

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As healthcare organizations plan to meet the increasingly complex information requirements of new patient care delivery systems, they must develop strategies for evolving their current health information systems toward an EMRS. One approach is to augment commercial systems with timely and valuable clinical decision support. This would communicate recommended standards of practice to physicians, and contribute to on-going efforts to improve the quality of patient care.

To test this approach, we developed a prototype clinical decision support system. Components of this prototype include objects which model the medical entities found in the real world and domain models of patient interactions with a health care system. The domain models are operational views of health care delivery, and provide an organizational framework for the information gathered during a patient's interaction with the health care system. Because these domain models maintain the context for the data gathered during a clinician/ patient interaction, they form the basis of our EMRS investigations.

The domain models show the interrelationships of a patient and the health care system. They are similar to conceptual models developed by other investigators [1]. Both include concepts such as patient, location, order, diagnostic procedure, etc. The conceptual models are intended to bridge the gap between the physical data model (the data organization within the database management system) and the logical data model (the application's view of the data) while isolating the domain experts from the data organization. Because we are using object-oriented methods, we can develop a single unified domain model which is directly representable in the underlying technology being used in our EMRS investigations. This single unified domain model is also equivalent to both the physical model (in the object-oriented database), and the logical model in the decision support application. Since there is a single unified domain model, system developers can work with domain experts using

the expert's language. This results in applications that more accurately reflect the domain under consideration.

To develop our models, we formed reasonable statements of clinical care, taking into account both patient and clinician viewpoints. Our goal was to create statements that were as general as possible while at the same time specific enough to capture the important concepts associated with clinical care. The statements of clinical care were reviewed by clinicians from different areas for completeness. We performed an initial analysis of the statements using several object-oriented analysis and design methods including Object Behavior Analysis and Class/Responsibility/Collaboration (CRC) techniques [2] [3].

Once all objects in these statements were identified, we examined their attributes and relationships in order to identify similarities. These similarities can help identify abstract objects not immediately recognizable during preliminary analysis. We then developed a graphical representation using a notation suitable for illustrating objects, attributes and relationships [4]. We also implemented these objects in Smalltalk [5] in order to investigate how they might interact in and be useful for EMRS development. Our next step will be to verify these models and investigate several approaches to object persistence.

References

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